

United States Department of Agriculture Natural Resources Conservation Service

Ecological Site Description

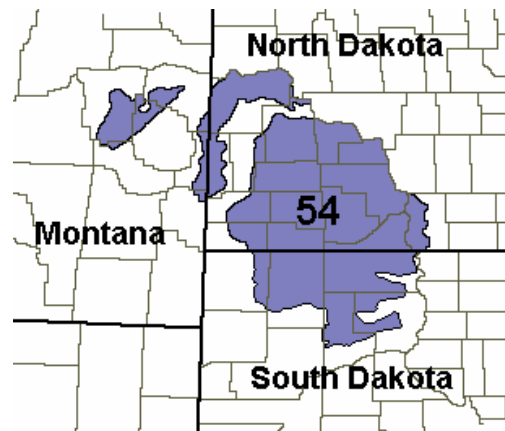
Site Name: Clayey

Site Type: Rangeland

Site ID: R054XY020ND

Major Land Resource Area (MLRA): 54 – Rolling Soft Shale Plain

For more information on MLRA's, refer to the following web site: http://www.essc.psu.edu/soil_info/soil_1rr/.



Physiographic Features

This site occurs on gently undulating to rolling sedimentary uplands.

Landform: alluvial fan, alluvial flat, hill, and knoll.

Aspect: NA

	<u>Minimum</u>	<u>Maximum</u>
Elevation (feet):	1600	3600
Slope (percent):	0	25
Water Table Depth (inches):	48	>72
Flooding:		
Frequency:	None	None
Duration:	None	None
Ponding:		
Depth (inches):	None	None
Frequency:	None	None
Duration:	None	None
Runoff Class:	High	Very high

Climatic Features

MLRA 54 is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature are characteristic. The climate is the result of this MLRA's location in the geographic center of North America. There are few natural barriers on the northern Great Plains. The air masses move unobstructed across the plains and account for rapid changes in temperature.

Annual precipitation ranges from 14 to 18 inches per year. The normal average annual temperature is about 42°F. January is the coldest month with average temperatures ranging from about 13°F (Beach, North Dakota (ND)) to about 16°F (Bison, South Dakota (SD)). July is the warmest month with temperatures averaging from about 69°F (Beach, ND,) to about 72°F (Timber Lake, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 57°F. This large annual range attests to the continental nature of this MLRA's climate. Hourly winds are estimated to average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour during the summer. Daytime

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winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 miles per hour.

Growth of native cool-season plants begins in late March and continues to early to mid July. Native warm-season plants begin growth in mid May and continue to the end of August. Green up of cool-season plants can occur in September and October when adequate soil moisture is present.

	<u>Minimum</u>	<u>Maximum</u>
Frost-free period (days):	119	136
Freeze-free period (days):	139	157
Mean Annual Precipitation (inches):	14	18

Average Monthly Precipitation (inches) and Temperature (°F):

	Precip. Min.	Precip. Max	Temp. Min.	Temp. Max.
January	0.41	0.54	2.2	23.8
February	0.37	0.61	8.7	30.4
March	0.51	1.07	17.1	40.0
April	1.13	1.88	28.9	56.8
May	1.98	2.83	40.5	69.3
June	2.83	3.29	49.8	78.3
July	2.05	2.25	54.6	85.2
August	1.49	2.07	53.0	84.3
September	1.29	1.45	42.0	73.4
October	0.89	1.35	31.6	60.4
November	0.48	0.61	19.0	41.5
December	0.42	0.55	8.1	29.0

Climate Stations		Period	
Station ID	Location or Name	From	To
ND0590	Beach	1949	1999
MT7560	Sidney	1949	1999
SD8307	Timber Lake	1948	1999
ND2183	Dickinson FAA AP	1948	1999

For local climate stations that may be more representative, refer to <http://www.wcc.nrcs.usda.gov>.

Influencing Water Features

No significant water features influence this site.

Representative Soil Features

The common features of soils in this site are the silty clay to clay textured subsoils and slopes of 0 to 25 percent. The soils in this site are moderately well to well drained and formed in soft siltstone, shales, or alluvium. The silty clay loam to loam surface layer is 5 to 14 inches thick. The soils have a moderately slow to slow infiltration rate. When dry these soils crack. Wet surface compaction can occur with heavy traffic. This site should show slight to no evidence of rills, wind scoured areas, or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Subsurface soil layers are non-restrictive to water movement and root penetration.

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These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about five percent. Loss of the soil surface layer can result in a shift in species composition and/or production.

Major soil series correlated to this ecological site can be found in Section II of the Natural Resources Conservation Service (NRCS) Field Office Technical Guide or the following web sites:

North Dakota: <http://www.nd.nrcs.usda.gov>

South Dakota: <http://www.sd.nrcs.usda.gov>

Montana: <http://www.mt.nrcs.usda.gov>

Parent Material Kind: alluvium and residuum
Parent Material Origin: shale and siltstone
Surface Texture: silt loam, silty clay loam, silty clay
Surface Texture Modifier: none
Subsurface Texture Group: clayey
Surface Fragments $\leq 3''$ (% Cover): 0
Surface Fragments $> 3''$ (%Cover): 0
Subsurface Fragments $\leq 3''$ (% Volume): 0-20
Subsurface Fragments $> 3''$ (% Volume): 0

	<u>Minimum</u>	<u>Maximum</u>
Drainage Class:	moderately well	well
Permeability Class:	very slow	slow
Depth to first restrictive layer (inches):	20	72
Electrical Conductivity (mmhos/cm)*:	0	8
Sodium Absorption Ratio*:	0	15
Soil Reaction (1:1 Water)*:	6.1	8.5
Soil Reaction (0.1M CaCl₂)*:	NA	NA
Available Water Capacity (inches)*:	5	7
Calcium Carbonate Equivalent (percent)*:	0	15

* - These attributes represent from 0-40 inches or to the first restrictive layer.

Plant Communities

Ecological Dynamics of the Site:

The site developed under Northern Great Plains climatic conditions, and included natural influence of large herbivores and occasional fire. Changes will occur in the plant communities due to management actions and/or climatic conditions. Due to the nature of the soils, the site is considered moderately resilient. Under continued adverse impacts, a moderate decline in vegetative vigor and composition will occur. Under favorable vegetative management treatments, the site can readily return to the Historic Climax Plant Community (HCPC).

The plant community upon which interpretations are primarily based is the HCPC. The HCPC has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been considered. Subclimax plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

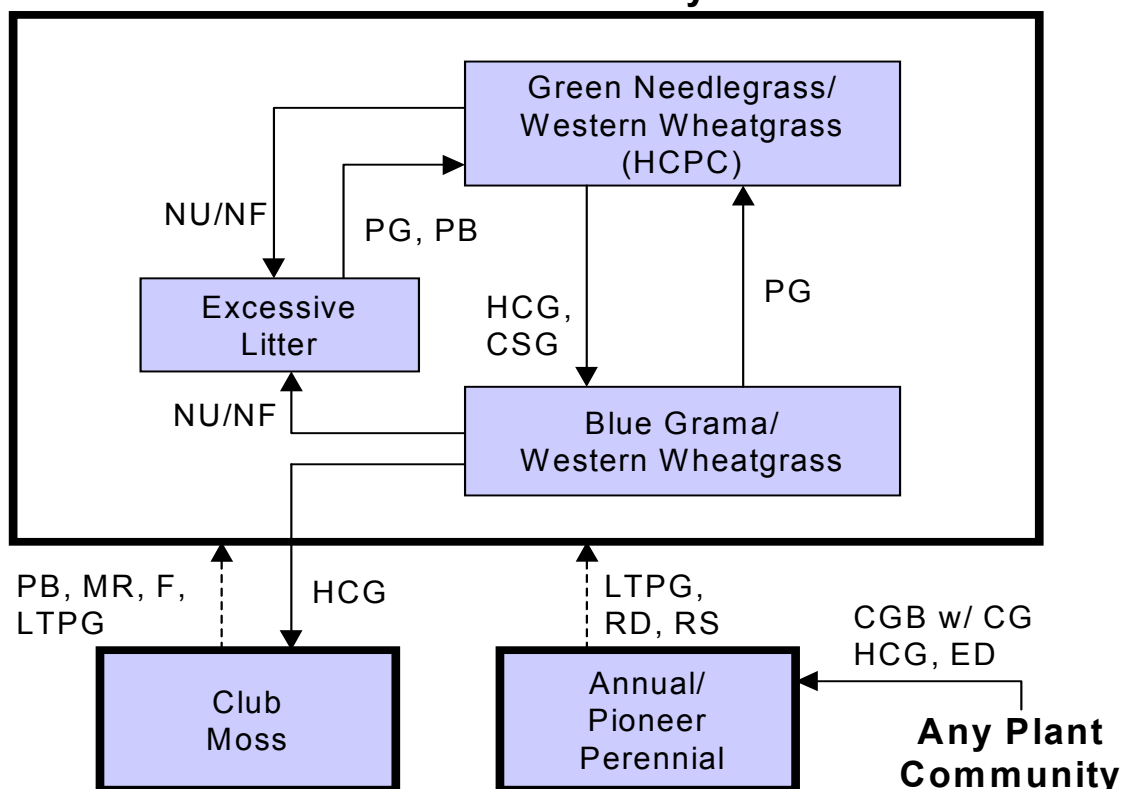
Heavy continuous grazing and/or continuous seasonal (spring) grazing, without adequate recovery periods following each grazing occurrence causes this site to depart from the HCPC. Blue grama and buffalograss will begin to increase. Western wheatgrass will increase initially and

then begin to decrease. Green needlegrass will decrease in frequency and production. In time, heavy continuous grazing will likely cause blue grama and buffalograss to dominate and pioneer perennials, annuals, and club moss (in its range) to increase. This plant community is relatively stable and the competitive advantage prevents other species from establishing. This plant community is less productive than the HCPC. Runoff increases and infiltration will decrease. Soil erosion will be minimal.

Extended periods of non-use and/or lack of fire will result in a plant community having high litter levels, which favors an increase in Kentucky bluegrass and/or smooth brome grass.

The following is a diagram that illustrates the common plant communities that can occur on the site and the transition pathways between communities. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

Plant Communities and Transitional Pathways



CGB w/ CG - cropped go-back with continuous grazing; **CSG** - continuous seasonal grazing; **ED** - excessive defoliation; **F** - fertilization followed with prescribed grazing; **HCPC** - Historical Climax Plant Community; **HCG** - heavy continuous grazing; **LTPG** - long-term prescribed grazing; **MR** - mechanical renovation with prescribed grazing; **NU/NF** - extended period of non-use & no fire; **PB** - prescribed burning; **PG** - prescribed grazing; **RD** - removal of disturbance; **RS** - range seeding with prescribed grazing

Plant Community Composition and Group Annual Production

		Green Needlegrass/ Western Wheatgrass (HCPC)			
COMMON/GROUP NAME	SYMBOL	Group	lbs./acre	% Comp	
GRASSES & GRASS-LIKES			1890 - 1995	90 - 95	
WHEATGRASS		1	525 - 840	25 - 40	
western wheatgrass	PASM	1	525 - 840	25 - 40	
thickspike wheatgrass	ELLAL	1	0 - 210	0 - 10	
NEEDLEGRASS		2	420 - 630	20 - 30	
green needlegrass	NAVI4	2	315 - 525	15 - 25	
porcupine grass	HESP11	2	0 - 63	0 - 3	
SHORT WARM-SEASON		3	105 - 210	5 - 10	
blue grama	BOGR2	3	105 - 210	5 - 10	
buffalograss	BUDA	3	21 - 105	1 - 5	
NATIVE COOL-SEASON		4	21 - 126	1 - 6	
needleandthread	HECOC8	4	21 - 105	1 - 5	
prairie junegrass	KOMA	4	21 - 63	1 - 3	
plains reedgrass	CAMO	4	21 - 63	1 - 3	
slender wheatgrass	ELTRT	4	21 - 63	1 - 3	
Sandberg bluegrass	POSE	4	21 - 42	1 - 2	
sedge	CAREX	4	21 - 42	1 - 2	
OTHER NATIVE GRASSES		5	21 - 126	1 - 6	
big bluestem	ANGE	5	0 - 105	0 - 5	
sideoats grama	BOCU	5	0 - 105	0 - 5	
plains muhly	MUCU3	5	0 - 42	0 - 2	
inland saltgrass	DISP	5	0 - 21	0 - 1	
other perennial grasses	2GP	5	21 - 105	1 - 5	
FORBS		6	42 - 105	2 - 5	
American vetch	VIAM	6	21 - 21	1 - 1	
biscuitroot	LOMAT	6	21 - 21	1 - 1	
cudweed sagewort	ARLU	6	21 - 42	1 - 2	
false boneset	BREU	6	21 - 21	1 - 1	
gayfeather	LIATR	6	21 - 42	1 - 2	
goldenpea	THRH	6	21 - 42	1 - 2	
goldenrod	SOLID	6	21 - 42	1 - 2	
green sagewort	ARDR4	6	21 - 42	1 - 2	
heath aster	SYER	6	21 - 42	1 - 2	
Lambert crazyweed	OXLA3	6	21 - 42	1 - 2	
larkspur	DELPH	6	0 - 21	0 - 1	
prairie coneflower	RACO3	6	21 - 42	1 - 2	
prairie onion	ALST	6	21 - 21	1 - 1	
prairie smoke	GETR	6	21 - 21	1 - 1	
purple coneflower	ECAN2	6	0 - 21	0 - 1	
pussytoes	ANTEN	6	0 - 21	0 - 1	
rush skeletonweed	LYJU	6	0 - 21	0 - 1	
scarlet gaura	GACO5	6	21 - 42	1 - 2	
scarlet globemallow	SPCO	6	21 - 42	1 - 2	
scurfpea	PSORA2	6	21 - 42	1 - 2	
spiny phlox	PHHO	6	0 - 21	0 - 1	
wavyleaf thistle	CIUN	6	21 - 21	1 - 1	
western yarrow	ACMI2	6	21 - 42	1 - 2	
white prairie aster	SYFA	6	0 - 21	0 - 1	
wild parsley	MUDI	6	21 - 42	1 - 2	
other perennial forbs	2FP	6	0 - 42	0 - 2	
other annual forbs	2FA	6	0 - 21	0 - 1	
SHRUBS		7	21 - 63	1 - 3	
prairie rose	ROAR3	7	21 - 42	1 - 2	
silver sagebrush	ARCA13	7	0 - 21	0 - 1	
winterfat	KRLA2	7	0 - 21	0 - 1	
western snowberry	SYOC	7	21 - 42	1 - 2	
plains pricklypear	OPPO	7	0 - 21	0 - 1	
fringed sagewort	ARFR4	7	21 - 42	1 - 2	
other shrubs	2SHRUB	7	0 - 21	0 - 1	
Annual Production lbs./acre			LOW	RV	HIGH
GRASSES & GRASS-LIKES			1240 -	1985	-2925
FORBS			40 -	74	-110
SHRUBS			20 -	42	-65
TOTAL			1300 -	2100	-3100

This list of plants and their relative proportions are based on near normal years. Fluctuations in species composition and relative production may change from year to year dependent upon precipitation or other climatic factors. RV = Representative Value.

Plant Community Composition and Group Annual Production

COMMON/GROUP NAME	SYMBOL	Green Needlegrass/ Western Wheatgrass (HCPC)			Blue Grama/ Western Wheatgrass			Excessive Litter			Club Moss		
		Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp	Grp	lbs./acre	% Comp
GRASSES & GRASS-LIKES			1890 - 1995	90 - 95		560 - 630	80 - 90		1615 - 1805	85 - 95		330 - 390	55 - 65
WHEATGRASSES		1	525 - 840	25 - 40	1	35 - 140	5 - 20	1	19 - 190	1 - 10	1	30 - 120	5 - 20
western wheatgrass	PASM	1	525 - 840	25 - 40	1	35 - 140	5 - 20	1	19 - 133	1 - 7	1	30 - 120	5 - 20
thickspike wheatgrass	ELLAL	1	0 - 210	0 - 10	1	0 - 35	0 - 5	1	0 - 95	0 - 5	1	0 - 30	0 - 5
NEEDLEGRASSES		2	420 - 630	20 - 30	2	0 - 56	0 - 8	2	19 - 133	1 - 7	2		
green needlegrass	NAV4	2	315 - 525	15 - 25	2	0 - 56	0 - 8	2	19 - 133	1 - 7			
porcupine grass	HESP11	2	0 - 63	0 - 3	2	0 - 14	0 - 2						
SHORT WARM-SEASON		3	105 - 210	5 - 10	3	210 - 301	30 - 43	3	0 - 76	0 - 4	3	90 - 120	15 - 20
blue grama	BOGR2	3	105 - 210	5 - 10	3	245 - 280	35 - 40	3	0 - 57	0 - 3	3	60 - 120	10 - 20
buffalograss	BUDA	3	21 - 105	1 - 5	3	21 - 56	3 - 8	3	0 - 57	0 - 3	3	30 - 60	5 - 10
NATIVE COOL-SEASON		4	21 - 126	1 - 6	4	14 - 28	2 - 4	4	95 - 190	5 - 10	4	12 - 48	2 - 8
needleandthread	HECOC8	4	21 - 105	1 - 5	4	0 - 7	0 - 1	4	19 - 133	1 - 7	4	6 - 24	1 - 4
prairie junegrass	KOMA	4	21 - 63	1 - 3	4	7 - 21	1 - 3	4	19 - 76	1 - 4	4	6 - 24	1 - 4
plains reedgrass	CAMO	4	21 - 63	1 - 3									
slender wheatgrass	ELTRT	4	21 - 63	1 - 3					38 - 95	2 - 5			
Sandberg bluegrass	POSE	4	21 - 42	1 - 2	4	7 - 21	1 - 3	4	19 - 38	1 - 2	4	6 - 18	1 - 3
sedge	CAREX	4	21 - 42	1 - 2	4	7 - 28	1 - 4	4	19 - 76	1 - 4	4	6 - 18	1 - 3
OTHER NATIVE GRASSES		5	21 - 126	1 - 6	5	7 - 28	1 - 4	5	0 - 38	0 - 2	5	0 - 12	0 - 2
big bluestem	ANGE	5	0 - 105	0 - 5									
sideoats grama	BOCU	5	0 - 105	0 - 5	5	0 - 7	0 - 1						
plains muhly	MUCU3	5	0 - 42	0 - 2	5	0 - 21	0 - 3				5	0 - 6	0 - 1
inland saltgrass	DISP	5	0 - 21	0 - 1	5	0 - 7	0 - 1	5	0 - 19	0 - 1	5	0 - 6	0 - 1
other perennial grasses	ZGP	5	21 - 105	1 - 5	5	0 - 14	0 - 2	5	0 - 38	0 - 2	5	0 - 6	0 - 1
INTRODUCED GRASSES		6			6	0 - 14	0 - 2	6	380 - 950	20 - 50	6	6 - 30	1 - 5
bluegrass	POA				6	0 - 14	0 - 2	6	380 - 950	20 - 50	6	6 - 24	1 - 4
smooth bromegrass	BRIN2				6	0 - 14	0 - 2	6	0 - 950	0 - 50			
crested wheatgrass	AGCR				6	0 - 14	0 - 2	6	0 - 950	0 - 50			
cheatgrass	BRTE				6	0 - 14	0 - 2	6	0 - 285	0 - 15	6	6 - 24	1 - 4
FORBS		7	42 - 105	2 - 5	7	35 - 105	5 - 15	7	95 - 190	5 - 10	7	60 - 120	10 - 20
American vetch	VIAM	7	21 - 21	1 - 1									
biscuitroot	LOMAT	7	21 - 21	1 - 1									
cudweed sagewort	ARLU	7	21 - 42	1 - 2	7	0 - 14	0 - 2	7	19 - 57	1 - 3	7	0 - 12	0 - 2
curlycup gumweed	GRSQ				7	7 - 21	1 - 3	7	0 - 38	0 - 2	7	0 - 18	0 - 3
false boneset	BREU	7	21 - 21	1 - 1									
gayfeather	LIATR	7	21 - 42	1 - 2	7	0 - 14	0 - 2	7	0 - 38	0 - 2			
goldenpea	THRH	7	21 - 42	1 - 2	7	0 - 14	0 - 2						
goldenrod	SOLID	7	21 - 42	1 - 2	7	7 - 21	1 - 3	7	0 - 38	0 - 2			
green sagewort	ARDR4	7	21 - 42	1 - 2	7	7 - 42	1 - 6	7	19 - 76	1 - 4	7	6 - 42	1 - 7
heath aster	SYERE	7	21 - 42	1 - 2	7	7 - 28	1 - 4	7	0 - 57	0 - 3	7	0 - 12	0 - 2
Lambert crazyweed	OXL3	7	21 - 42	1 - 2	7	7 - 21	1 - 3				7	0 - 6	0 - 1
larkspur	DELPH	7	0 - 21	0 - 1	7	0 - 14	0 - 2	7	0 - 38	0 - 2	7	0 - 6	0 - 1
prairie coneflower	RACO3	7	21 - 42	1 - 2	7	7 - 14	1 - 2						
prairie onion	ALST	7	21 - 21	1 - 1				7	19 - 19	1 - 1			
prairie smoke	GETR	7	21 - 21	1 - 1									
purple coneflower	ECAN2	7	21 - 42	1 - 2									
pussytoes	ANTEN	7	0 - 21	0 - 1	7	7 - 14	1 - 2				7	6 - 12	1 - 2
rush skeletonweed	LYJU	7	0 - 21	0 - 1	7	7 - 7	1 - 1	7	19 - 19	1 - 1	7	6 - 12	1 - 2
scarlet gaura	GACO5	7	21 - 42	1 - 2									
scarlet globemallow	SPCO	7	21 - 42	1 - 2	7	0 - 7	0 - 1				7	0 - 6	0 - 1
scurpea	PSORA2	7	21 - 42	1 - 2	7	7 - 21	1 - 3	7	19 - 38	1 - 2	7	6 - 12	1 - 2
spiny phlox	PHHO	7	0 - 21	0 - 1	7	7 - 14	1 - 2				7	6 - 12	1 - 2
sweetclover	MELIL				7	7 - 14	1 - 2	7	0 - 190	0 - 10	7	0 - 24	0 - 4
wavyleaf thistle	CIUN	7	21 - 21	1 - 1	7	7 - 14	1 - 2	7	0 - 38	0 - 2	7	0 - 12	0 - 2
western salsify	TRDU				7	7 - 21	1 - 3	7	19 - 57	1 - 3	7	0 - 12	0 - 2
western yarrow	ACMI2	7	21 - 42	1 - 2	7	7 - 35	1 - 5	7	19 - 57	1 - 3	7	6 - 30	1 - 5
white prairie aster	SYFA	7	0 - 21	0 - 1									
wild parsley	MUDI	7	21 - 42	1 - 2									
other perennial forbs	ZFP	7	0 - 42	0 - 2	7	0 - 21	0 - 3	7	0 - 38	0 - 2	7	0 - 12	0 - 2
other annual forbs	ZFA	7	0 - 21	0 - 1	7	0 - 21	0 - 3	7	0 - 57	0 - 3	7	0 - 12	0 - 2
SHRUBS		8	21 - 63	1 - 3	8	0 - 14	0 - 2	8	19 - 95	1 - 5	8	30 - 90	5 - 15
prairie rose	ROAR3	8	21 - 42	1 - 2	8	0 - 14	0 - 2	8	0 - 38	0 - 2	8	0 - 12	0 - 2
silver sagebrush	ARCA13	8	0 - 21	0 - 1	8	0 - 7	0 - 1	8	0 - 19	0 - 1	8	0 - 12	0 - 2
winterfat	KRLA2	8	0 - 21	0 - 1									
western snowberry	SYOC	8	21 - 42	1 - 2	8	0 - 14	0 - 2	8	19 - 95	1 - 5	8	0 - 12	0 - 2
plains pricklypear	OPPO	8	0 - 21	0 - 1	8	0 - 14	0 - 2	8	0 - 19	0 - 1	8	6 - 12	1 - 2
brittle cactus	OPFR				8	0 - 14	0 - 2	8	0 - 19	0 - 1	8	6 - 12	1 - 2
fringed sagewort	ARFR4	8	21 - 42	1 - 2	8	7 - 14	1 - 2	8	0 - 38	0 - 2	8	6 - 24	1 - 4
broom snakeweed	GUSA2				8	7 - 14	1 - 2	8	0 - 38	0 - 2	8	6 - 30	1 - 5
other shrubs	ZSHRUB	8	0 - 21	0 - 1	8	0 - 7	0 - 1	8	0 - 19	0 - 1	8	0 - 6	0 - 1
CRYPTOGAMS					9	0 - 14	0 - 2	9	0 - 38	0 - 2	9	30 - 60	5 - 10
clubmoss	SEDE2				9	0 - 14	0 - 2	9	0 - 38	0 - 2	9	30 - 60	5 - 10
Annual Production lbs./acre		LOW RV HIGH			LOW RV HIGH			LOW RV HIGH			LOW RV HIGH		
GRASSES & GRASS-LIKES		1240 - 1985 - 2925			370 - 616 - 760			1095 - 1682 - 2265			195 - 405 - 515		
FORBS		40 - 74 - 110			30 - 70 - 110			90 - 143 - 195			55 - 90 - 125		
SHRUBS		20 - 42 - 65			0 - 7 - 15			15 - 57 - 100			25 - 60 - 95		
CRYPTOGAMS					0 - 7 - 15			0 - 19 - 40			25 - 45 - 65		
TOTAL		1300 - 2100 - 3100			400 - 700 - 900			1200 - 1900 - 2600			300 - 600 - 800		

This list of plants and their relative proportions are based on near normal years. Fluctuations in species composition and relative production may change from year to year dependent upon precipitation or other climatic factors. RV = Representative value.

Plant Community Vegetation State Narratives

Following are the narratives for each of the described plant communities. These plant communities may not represent every possibility, but they are the most prevalent and repeatable plant communities. The plant composition tables shown above have been developed from the best available knowledge at the time of this revision. As more data are collected, some of these plant communities may be revised or removed, and new ones may be added. None of these plant communities should necessarily be thought of as “Desired Plant Communities” (DPC). According to the USDA NRCS National Range and Pasture Handbook, DPC’s will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for including any description of a plant community here is to capture the current knowledge and experience at the time of this revision.

Green Needlegrass/Western Wheatgrass Plant Community

This is the interpretive plant community and is considered to be the HCPC. This community evolved with grazing by large herbivores and occasional prairie fires and can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest.

The potential vegetation is about 90 percent grasses or grass-like plants, 5 percent forbs, and 5 percent shrubs. Green needlegrass and western wheatgrass dominate the plant community. Other grasses and grass-like plants include thickspike wheatgrass, needleandthread, blue grama, porcupine grass, buffalograss, prairie Junegrass, and sedges. Significant forbs include scurfpea, Lambert’s crazyweed, scarlet globemallow, cudweed sagewort, and western yarrow. In many areas, western snowberry is the principal shrub and occurs in patchy mosaics. In other areas, silver sagebrush is the dominant shrub and occurs more evenly dispersed across the site. Other shrubs include prairie rose, leadplant, winterfat, and fringed sagewort.

This plant community is well adapted to the Northern Great Plains climatic conditions. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. Plant litter is properly distributed with very little movement offsite and natural plant mortality is very low. The diversity in plant species allows for high drought tolerance. Runoff from adjacent sites and moderate or high available water capacity provides a favorable soil-water-plant relationship.

The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during a normal year.

Growth curve number: ND5401

Growth curve name: Missouri Slope, Native Grasslands, Cool-season Dominant.

Growth curve description: Cool-season, mid-grass dominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	8	24	45	10	3	5	2	0	0

Transitional pathways and/or community pathways leading to other plant communities are as follows:

- Non-use and no fire for extended periods of time will convert this plant community to the *Excessive Litter Plant Community*.
- Heavy, continuous grazing will convert the plant community to the *Blue Grama/Western Wheatgrass Plant Community*.

- Continuous seasonal (i.e., spring) grazing will convert the plant community to the *Blue Grama/Western Wheatgrass Plant Community*.
- Excessive defoliation (i.e., areas of heavy animal concentration) will convert the plant community to the *Annual/Pioneer Perennial Plant Community*.
- Cropped go-back land with continuous grazing will convert this plant community to the *Annual/Pioneer Perennial Plant Community*.

Blue Grama/Western Wheatgrass Plant Community

This plant community is the result of long-term, heavy, continuous grazing and/or annual, early spring seasonal grazing. Repeated spring grazing depletes stored carbohydrates, resulting in weakening and eventual death of the cool season mid-grasses. Blue grama and western wheatgrass are the dominant species with the balance being a few species of cool-season grasses/grass-likes and warm-season grasses including upland sedges, needleandthread, prairie Junegrass, and annual grasses. Forbs such as western ragweed, scurfpea, cudweed sagewort, and scarlet globemallow may also be present. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur.

This plant community is less productive than the HCPC. Lack of litter and reduced plant vigor result in higher soil temperatures, poor water infiltration rates, and high evapotranspiration, which gives blue grama a competitive advantage over cool-season mid-grasses.

The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during a normal year.

Growth curve number: ND5403

Growth curve name: Missouri Slope, Native Grasslands, Warm-season dominant.

Growth curve description: Warm-season dominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	1	5	20	38	25	8	3	0	0	0

Transitional pathways and/or community pathways leading to other plant communities are as follows:

- Heavy, continuous grazing may cause further deterioration resulting in a shift to the *Club Moss Plant Community*.
- Heavy, continuous grazing and/or excessive defoliation may shift this plant community to the *Annual/Pioneer Perennial Plant Community*.
- Non-use and no fire over an extended period of time may lead this plant community to the *Excessive Litter Plant Community*. This shift may take considerably longer than the corresponding transition from HCPC, depending on how much residual cool-season mid-grasses are present upon initiation of non-use or fire exclusion.
- Cropped go-back land with continuous grazing will convert this plant community to the *Annual/Pioneer Perennial Plant Community*.
- Prescribed grazing that includes changing season of use and allowing adequate recovery periods between grazing events will lead this plant community back to the *Green Needlegrass/Western Wheatgrass Plant Community (HCPC)*.

Excessive Litter Plant Community

This plant community develops after an extended period of 10 or more years of non-use by herbivores or exclusion of fire. Non-native grasses, such as Kentucky bluegrass, crested wheatgrass, and smooth brome grass tend to invade and may dominate this plant community. Other grasses present include western wheatgrass, porcupine grass, green needlegrass, and Sandberg bluegrass. The common forbs include sweetclover and cudweed sagewort. Western snowberry and/or silver sagebrush are the principal shrubs and tend to increase in density and cover.

Litter buildup reduces plant vigor and density, and native seedling recruitment declines. Due to a lack of tiller stimulation and sunlight, native bunchgrasses typically develop dead centers and native rhizomatous grasses are limited to small colonies. This plant community is dispersed throughout the pasture, encircling spot grazed areas, and areas distant from water sources. This is a typical pattern found in properly stocked pastures grazed season-long.

This plant community is resistant to change without prescribed grazing or fire. The combination of both grazing and fire is most effective in moving this plant community towards the HCPC. Soil erosion is low. Runoff is similar to the HCPC. Once this plant community is reached, time and external resources will be needed to see any recovery in diversity.

The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during a normal year.

Growth curve number: ND5406

Growth curve name: Missouri Slope, Introduced Cool-season Grasses.

Growth curve description: Introduced cool-season grasses.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	3	10	35	35	5	2	8	2	0	0

Transitional pathways and/or community pathways leading to other plant communities are as follows:

- Prescribed grazing or prescribed burning followed by prescribed grazing will move this plant community toward the *Western Wheatgrass/Green Needlegrass Plant Community (HCPC)*. This would require long-term management with prescribed grazing and/or prescribed burning under controlled conditions.

Club Moss Plant Community

This plant community typically occurs in the western portion of MLRA 54. A dense sod of club moss dominates this plant community. Club moss occupies bare soil areas within deteriorated or disturbed higher successional plant communities due to long-term repeated disturbances. Club moss cover is often 25 percent or greater. Club moss creates a more arid microclimate, resulting in extreme competition for available moisture. Vigor and production of other species is reduced dramatically.

Grasses and grass-like plants include western wheatgrass, needleandthread, blue grama, prairie Junegrass, and upland sedges. Forbs commonly found in this plant community include green sagewort and western yarrow. When compared to the Green Needlegrass/Western Wheatgrass Plant Community, blue grama and club moss have increased, while green needlegrass and western wheatgrass have decreased.

This plant community is very resistant to change. The competitive advantage of both the clubmoss and the blue grama prevents other species from expanding and establishing. This plant community is far less productive than the HCPC. Initial runoff rates are low but then increase as

clubmoss becomes saturated. Once clubmoss has been saturated then runoff increases and infiltration decreases as compared HCPC. Soil erosion will be minimal due to the sod forming habit of both the clubmoss and blue grama.

The following growth curve represents monthly percentages of total annual growth of the dominant species during a normal year:

Growth curve number: ND5403

Growth curve name: Missouri Slope, Native Grasslands, Warm-season dominant.

Growth curve description: Warm-season dominant.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	0	1	5	20	38	25	8	3	0	0	0

Transitional pathways and/or community pathways leading to other plant communities are as follows:

- Fertilization combined with prescribed grazing may move this plant community through the successional stages leading toward the *Green Needlegrass/Western Wheatgrass Plant Community*.
- Mechanical renovation followed by prescribed grazing will reduce club moss, increase western wheatgrass, and eventually shift this plant community back toward the *Green Needlegrass/Western Wheatgrass Plant Community*.
- Prescribed burning may reduce club moss, and eventually convert this plant community back to the *Green Needlegrass/Western Wheatgrass Plant Community*.
- Long-term prescribed grazing with adequate recovery periods following each grazing event and proper stocking over long periods of time move this plant community toward the *Blue Grama/Western Wheatgrass Plant Community*. It may eventually return to the *HCPC* or associated successional plant community stages assuming an adequate seed/vegetative source is available. This process may take greater than 20 years.

Annual/Pioneer Perennial Plant Community

This plant community develops under severe disturbance and/or excessive defoliation. This can result from heavy livestock or wildlife concentration, and cropping abandonment (go-back land). The dominant vegetation includes pioneer annual grasses, forbs, invaders, and early successional biennial and perennial species. Grasses may include red threeawn, sixweeks fescue, smooth brome, crested wheatgrass, annual brome, needleandthread, prairie Junegrass, and western wheatgrass. The dominant forbs include curlycup gumweed, maretail, salsify, kochia, field bindweed, thistles, western ragweed, pussytoes, prostrate verbena, and other early successional species. Shrubs that may be present include prairie rose, fringed sage, and broom snakeweed. Plant species from adjacent ecological sites may become minor components of this plant community. The community is susceptible to invasion of other nonnative species due to severe soil disturbances and relatively high percent of bare ground.

This plant community is resistant to change, as long as soil disturbance or severe vegetation defoliation persists, thus holding back secondary plant succession. Soil erosion is potentially high in this vegetation state. Reduced surface cover, low plant density, low plant vigor, loss of root biomass, and soil compaction, all contribute to decreased water infiltration, increased runoff, and accelerated erosion rates.

Significant economic inputs, management, and time would be required to move this plant community toward a higher successional stage and a more productive plant community. Secondary succession is highly variable, depending upon availability and diversity of a viable seed bank of higher successional species within the existing plant community and neighboring plant communities. This plant community can be renovated to improve the production capability, but management changes would be needed to maintain the new plant community.

Transitional pathways and/or community pathways leading to other plant communities are as follows:

- Under long-term prescribed grazing and/or removal of disturbance, including adequate rest periods, this plant community will move through the successional stages, and may eventually lead to a plant community resembling the *Green Needlegrass/Western Wheatgrass Plant Community (HCPC)*. Depending on the slope, aspect, and size, and if adequate perennial plants exist, this change can occur more rapidly. This process will likely take a long period of time (50+ years).
- Range seeding followed with prescribed grazing can be used to convert this plant community to one that may resemble the *HCPC*.

Ecological Site Interpretations

Animal Community – Wildlife Interpretations

-- Under Development --

Green Needlegrass/Western Wheatgrass Plant Community:

Blue Grama/Western Wheatgrass Plant Community:

Excessive Litter Plant Community:

Clubmoss Plant Community:

Annual/Pioneer Perennial Plant Community:

Animal Preferences (Quarterly – 1,2,3,4[†])

Common Name	Cattle	Sheep	Horses	Deer	Antelope	Bison	Elk
Grasses & Grass-like							
big bluestem	U D P D	U D U U	U D P D	U D U U	U D U U	U D P D	U D P D
blue grama	U D P U	D P P D	U D P U	D P P D	D P P D	U D P U	U D P U
bluegrass	U D U U	D P U D	U D U U	U P N D	U P N D	U D U U	U D U U
buffalograss	U U D U	N U D U	U U D U	N U D U	N U D U	U U D U	U U D U
cheatgrass	U D U U	N P U N	U D U U	N P U N	N P U N	U D U U	U D U U
crested wheatgrass	U P U D	U P N N	U P U D	U P N N	U P N N	U P U D	U P U D
green needlegrass	U P U D	N P N P	U P U D	N P N P	N P N P	U P U D	U P U D
inland saltgrass	N U U N	N N N N	N U U N	N N N N	N N N N	N U U N	N U U N
needleandthread	U D U D	N D N U	U D U D	N D N U	N D N U	U D U D	U D U D
plains muhly	U U D U	U U D U	U U D U	N N N N	N N N N	U U D U	U U D U
plains reedgrass	U D U U	N D N N	U D U U	N D N N	N D N N	U D U U	U D U U
porcupine grass	U P U D	N D N U	U P U D	N D N U	N D N U	U P U D	U P U D
prairie junegrass	U D U D	N D N U	U D U D	N D N U	N D N U	U D U D	U D U D
Sandberg bluegrass	N U N N	N D N N	N U N N	N D N N	N D N N	N U N N	N U N N
sedge	U D U D	U P N D	U D U D	U D U D	U D U D	U D U D	U D U D
side oats grama	U D P U	U P D U	U D P U	U P D U	U P D U	U D P U	U D P U
slender wheatgrass	U P U U	N D U N	U P U U	N D U N	N D U N	U P U U	U P U U
smooth brome	U P U U	U P U U	U P U U	U P U U	U P U U	U P U U	U P U U
thickspike wheatgrass	U D D U	N D N N	U D D U	N D N N	N D N N	U D D U	U D D U
western wheatgrass	U P D U	N D N N	U P D U	N D N N	N D N N	U P D U	U P D U
Forbs							
American vetch	U D P U	U P P U	U D P U	U P P U	U P P U	U D P U	U P P U
biscuitroot	U D U U	U D D U	U D U U	U D D U	U D D U	U D U U	U D D U
cudweed sagewort	U U U U	U U D U	U U U U	U U D U	U U D U	U U U U	U U D U
false boneset	U U D U	N D U N	U U D U	N D U N	N D U N	U U D U	N D U N
gayfeather	U U D U	U P P U	U U D U	U P P U	U P P U	U U D U	U P P U
goldenpea	U U U U	U D U U	U U U U	U D U U	U D U U	U U U U	U D U U
goldenrod	U U D U	N U U N	U U D U	N U U N	N U U N	U U D U	N U U N
green sagewort	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U
heath aster	U U D U	U U P U	U U D U	U U P U	U U P U	U U D U	U U P U
Lambert crazyweed	T T T T	T T T T	T T T T	T T T T	T T T T	T T T T	T T T T
larkspur	T T T T	T T T T	T T T T	T T T T	T T T T	T T T T	T T T T
prairie coneflower	U U D U	U P P U	U U D U	U P P U	U P P U	U U D U	U P P U
prairie smoke	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N
purple coneflower	U U D U	U P P U	U U D U	U P P U	U P P U	U U D U	U P P U
pussytoes	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U	U U U U
rush skeletonweed	U U U U	N N N N	U U U U	N N N N	N N N N	U U U U	N N N N
scarlet gaura	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N
scarlet globemallow	U U D U	U D D U	U U D U	U D D U	U D D U	U U D U	U D D U
scurfpea	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N
spiny phlox	U D U U	U P P U	U D U U	U P P U	U P P U	U D U U	U P P U
wavyleaf thistle	U U U U	N N N N	U U U U	N N N N	N N N N	U U U U	N N N N
western yarrow	U U U U	N U U N	U U U U	N U U N	N U U N	U U U U	N U U N
white prairie aster	U U D U	N N N N	U U D U	N N N N	N N N N	U U D U	N N N N
wild onion	U D U U	U D D U	U D U U	U D D U	U D D U	U D U U	U D D U
wild parsley	U D U U	U D D U	U D U U	U D D U	U D D U	U D U U	U D D U
Shrubs							
fringed sagewort	U U U U	U U U U	U U U U	U D D U	U P P D	U U U U	U U U D
plains pricklypear	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N	N N N N
prairie rose	U D D U	U D D U	U D D U	U D D U	U D D U	U D D U	U D D U
silver sagebrush	D U U D	D U U D	D U U D	P D D P	P P P P	D U U D	D U U D
western snowberry	U U U U	U U U U	U U U U	D U D D	U U U U	U U U U	D U U U
winterfat	P P P P	P P P P	P P P P	P P P P	P P P P	P P P P	P P P P

N = not used; U = undesirable; D = desirable; P = preferred; T = toxic

[†] Quarters: 1 – Jan., Feb., Mar.; 2 – Apr., May, Jun.; 3 – Jul., Aug., Sep.; 4 – Oct., Nov., Dec.

Animal Community – Grazing Interpretations

The following table lists suggested initial stocking rates for cattle under continuous grazing (year long grazing or growing season long grazing) under normal growing conditions; however, *continuous grazing is not recommended*. These are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process and may need to be adjusted due to diet preferences of other types or kinds of livestock and/or other factors. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a field visit is recommended, in all cases, to document plant composition and production. More precise carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

Plant Community	Production (lbs./acre)	Carrying Capacity ¹ (AUM/acre)
Green Needlegrass/Western Wheatgrass (HCPC)	2100	0.66
Excessive Litter	1900	0.60 ²
Blue Grama/Western Wheatgrass	700	0.22
Clubmoss	600	0.19
Annual/Pioneer Perennial	-- ³	-- ³

¹ Continuous season-long grazing by cattle under average growing conditions.

² Stocking rates may need to be adjusted due to palatability and/or availability of forage.

³ Highly variable; stocking rate needs to be determined onsite.

Hydrology Functions

Water is the principal factor limiting herbage production on this site. The site is dominated by soils in hydrologic groups C with localized areas in hydrologic group D. Infiltration varies from moderately slow to slow and runoff potential varies from medium to very high for this site depending on soil surface texture and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An exception would be where short grasses form a dense sod and dominate the site. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and increase runoff (refer to Section 4, NRCS National Engineering Handbook, for runoff quantities and hydrologic curves).

Recreational Uses

This site provides hunting opportunities for upland game species. The wide varieties of plants which bloom from spring until fall have an esthetic value that appeals to visitors.

Wood Products

No appreciable wood products are present on the site.

Other Products

Seed harvest of native plant species can provide additional income on this site.

Supporting Information

Associated Sites

- | | |
|----------------------------------|-------------------------------|
| (054XY021ND) – Claypan | (054XY023ND) – Loamy Overflow |
| (054XY022ND) – Closed Depression | (054XY028ND) – Shallow Clayey |
| (054XY031ND) – Loamy | (054XY033ND) – Thin Claypan |

Similar Sites

- (054XY021ND) – Claypan (Cp)
[well drained soils on uplands or terraces that don't receive extra moisture with a dense sodic subsoil below 6 inches with salts below 16 inches; indicator species are western wheatgrass with an understory of blue grama, heath aster, and western yarrow along with a few shrubs of fringed sagewort and Nuttall's Saltbush. This site has less western wheatgrass, considerably less green needlegrass, and lower production.]
- (054XY022ND) – Closed Depression (Cd)
[Poorly drained clayey soils with sodic subsoils and with noticeable redoximorphic features within depressions. Ponds periodically with no apparent water table. Indicator species: dominated by western wheatgrass with alkaligrass and foxtail barley intermixed, forb indicator is western dock, no shrubs. This site has more western wheatgrass and less green needlegrass, no blue grama or shrubs, more production and different landscape position.]
- (054XY031ND) – Loamy (Ly)
[Does not receive additional moisture. Found on dry uplands upslope from loamy terraces or loamy overflow sites, down slope from thin loamy or shallow loam sites. Similar landscape position as sandy, sands, clayey sites. Will ribbon greater than one inch and up to two inches. Indicator species are western wheatgrass some green needlegrass and blue grama, with fringed sagewort and western snowberry being the dominant shrubs. This site has less green needlegrass and western wheatgrass; slightly higher production, similar landscape position, different soil type.]
- (054XY028ND) – Shallow Clayey (SwCy)
[Well drained soils. More than 10 less than 20 inches to unweathered shales that restrict root penetration. Upslope of clayey site, surface layer will ribbon greater than two inches, upslope of clayey ecological sites. Indicator species: western wheatgrass dominates with little bluestem, plains muhly, sideoats grama and gayfeather. This site has less production, different landscape position, shallower soils, more little bluestem, plains muhly, and sideoats grama.]

Inventory Data References

Information presented here has been derived from NRCS clipping and other inventory data. Also, field knowledge of range-trained personnel was used. All descriptions were peer reviewed and/or field tested by various private, state, and federal agency specialists.

Those involved in developing this site description include: Dennis Froemke, NRCS Range Management Specialist; Dean Chamrad, NRCS State Range Management Specialist; Jeff Printz, NRCS State Range Management Specialist; L. Michael Stirling, NRCS Range Management

Site Type: Rangeland

MLRA: 54 – Rolling Soft Shale Plain

Clayey

R054XY020ND

Specialist; Stan Boltz, NRCS Range Management Specialist; Josh Saunders, NRCS Range Management Specialist; Darrell Vanderbusch, NRCS Resource Soil Scientist; Michael D. Brand, State Land Dept. Director Surface Management; David Dewald, NRCS State Biologist; and Brad Podoll, NRCS Biologist.

<u>Data Source</u>	<u>Number of Records</u>	<u>Sample Period</u>	<u>State</u>	<u>County</u>
SCS-RANGE-417	15	1970 – 1985	SD	Dewey, Perkins, Ziebach
Ocular estimates	5	1987 – 2000	ND	Dunn, Hettinger, Morton

State Correlation

This site has been correlated with Montana and South Dakota in MLRA 54.

Field Offices

Baker, MT	Buffalo, SD	Faith, SD	Mott, ND
Beach, ND	Carson, ND	Hettinger, ND	Selfridge, ND
Beulah, ND	Culbertson, MT	Killdeer, ND	Sidney, MT
Bison, SD	Dickinson, ND	Mandan, ND	Watford City, ND
Bowman, ND	Dupree, SD	McIntosh, SD	Wibaux, MT

Relationship to Other Established Classifications

Level IV Ecoregions of the Conterminous United States: 43a – Missouri Plateau.

Other References

High Plains Regional Climate Center, University of Nebraska, 830728 Chase Hall, Lincoln, NE 68583-0728. (<http://hpccsun.unl.edu>).

USDA, NRCS. National Water and Climate Center, 101 SW Main, Suite 1600, Portland, OR 97204-3224. (<http://www.wcc.nrcs.usda.gov>).

USDA, NRCS. National Range and Pasture Handbook, September 1997.

USDA, NRCS. National Soil Information System, Information Technology Center, 2150 Centre Avenue, Building A, Fort Collins, CO 80526. (<http://nasis.nrcs.usda.gov>).

USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

USDA, NRCS, Various Published Soil Surveys.

Site Description Approval

State Range Management Specialist

Date

State Range Management Specialist

Date

State Range Management Specialist

Date